Single-Handed

Cord/Cable

Management Device

The present application is a continuation-in-part of United States Patent Application Serial No. 10/327,435, filed December 20, 2002, issued on March 30, 2004 as U.S. Patent No. 6,712,320 which is a continuation of United States Patent Application Ser. No. 09/907,016, filed July 17, 2002, now issued as United States Patent No. 6,536,719.

Field of the Invention

The present invention pertains generally to the organization and storage of flexible tubes and cables, and more particularly to devices for releasably constraining flexible tubes and cable together in a manner amenable to quick and repeatable bundling.

Background of the Invention

The need to coil or bundle wires, cables, flexible tubes, ropes and hoses exists throughout industry and home life. Devices such as extension cords, cables, air hoses,

ropes, and other long, flexible articles (hereinafter referred to generically as "cables") present a storage problem, where coiled cables often become tangled due to the lack of constraints to keep the cables properly coiled. The traditional storage method is to wrap the cables around a person's elbow and between the thumb and forefinger. Once the cable has been coiled, some form of strap is placed around the coil and fastened to prevent the coil from tangling or uncoiling.

An early device devised to act as a strap consisted of a simple piece of bendable wire which could be twisted to retain the wire around the bundled cables. Twist ties, as these wire retainers are frequently called, provide an economical tie, but can not be easily attached single-handedly, and furthermore have limited lifespans due to fatiguing of the wire. Furthermore, untwisting the tie can often be difficult.

Plastic variations of the twist tie have been developed which rely on toothed engagement fasteners to prevent the tie from coming lose. One variation of a plastic tie uses a serrated end which is passed through a slot in the opposite end of the tie as a means of adjustably fastening the tie. Although this construction is economical, it likewise does not lend itself to single-handed installation. Furthermore, once fastened, the serrated edges can be difficult to withdraw from the slot, making it difficult to remove the tie, and thus release bundled cables.

Later developments, such as the tying means shown in United States Patent No. 4,958,791 to Nakamura, incorporate one or more teeth on the end or ends of the strap to lock the strap in the closed position. These straps also utilize a normally open position to ease the difficulties of placing cables into the cavity of the device, allowing easier single

handed operation. Once the device has been wrapped around the object or objects to be constrained, the ends of the strap are forced into engagement, locking the tie into place. Nakamura provides a pair of tabs to release the engagement teeth, allowing the band once fastened to be unlocked. Once unlocked, however, the mouth of the band is open, allowing bundled cables or wires to fall from the device. Furthermore, grouping the cables one at a time into the Nakamura device is difficult, since there is no method provided for holding the device while individual cables are placed into the device.

It is therefore an object of the present invention to provide a cable management device which is easily held to allow cables to be placed into the device one at a time, while reducing the likelihood of cables already placed into the device from falling out of the device. It is also an object of the present invention to provide a cable management device having a controllable mouth gap to ease the difficulties of placing cables or wires into the device. Finally, it is also an object of the present invention to provide a cable management device that can be readily released and reused.

Summary of the Invention

The present invention is directed to a cable bundling device. The cable bundling device has a flexible strap portion for surrounding the bights of a bundled group of cables, wires, or other long flexible articles (hereafter referred to generically as "cables"). The strap forms a circular shape to surround the bights. The circular shape forms a central cavity within which the cables may be restrained. The strap has three states. The strap has a first and a second end which form a discontinuity in the perimeter of the strap.

Removabley affixed finger grips are mounted adjacent to the ends of the strap, allowing the fingers of a user to be inserted into the finger grips to pull the ends apart, thereby opening a mouth into the cavity of the cable bundling device. The strap has a relaxed state wherein the first and second ends are close together, such that the mouth of the device must be opened through use of the finger grips before cables can be placed into or removed from the cable bundling device. The strap also has an open state wherein the ends of the strap have been pulled apart to form the mouth.

In a further embodiment, the cable bundling device has engagement features located on the ends of the strap, allowing the strap ends to be locked together. The engagement features may be a tooth extending from a first end of the strap, and a slot extending from the second end. Placement of the tooth into the slot limits the ability of the two ends to be separated, thereby locking cables into the cavity of the cable bundling device. Placement of the tooth into the slot may be accomplished by forcing the ends of the strap to overlap, allowing the tooth and slot to enter into an interlocked state.

In a still further embodiment, engagement features may include a plurality of teeth on one end, with at least one tooth on the opposite end, such that the position of the two strap ends can be varied in the locked state allowing the cable bundling device to be tightened around a group of bundled cables.

In a still further embodiment, the cable bundling device may include at least one retainer generally oppositely disposed from the discontinuity in the perimeter of the strap. A retainer may be fixed or removabley affixed to the cable bundling device and may be placed around an object suitable for anchoring the cable bundling device.

Other features and advantages of the invention will be apparent from the following description of the preferred embodiment, and from the claims.

Brief Description of the Drawings

Figure 1 shows a cross-sectional view of a cable bundling device according to the present invention as viewed along the long axis of the device, where the cable bundling device is shown in a relaxed state.

Figure 1A is a detail view of the mouth area of Figure 1.

Figure 2 shows a cable bundling device according present invention in an opened state.

Figure 3 shows a perspective view of a cable bundling device according to the present invention, with the cable bundling device nested in the palm of a user's hand.

Figure 4 shows a cable bundling device according to the present invention in cross-section as viewed along the long axis of the device, where the cable bundling device is shown in locked state.

Figure 5 shows in perspective a cable bundling device according to the present invention, wherein the device is formed from a metallic strap.

Figure 6 shows a view in partial cross-section along plane B-B as shown in Figure 7 of a cable bundling device as viewed along an axis perpendicular to the long axis of the device, wherein the finger grips comprise channels and backstraps.

Figure 7 shows a view in partial cross-section along plane A-A as shown in Figure 6 of a cable bundling device as viewed along the long axis of the device, wherein the finger grips comprise channels and backstraps.

Figure 8 shows a cross-sectional view of a cable bundling device according to the present invention as viewed along the long axis of the device, where the cable bundling device utilizes multiple teeth engagement means on both ends to provide a variable locked position.

Figure 9 shows a cross-sectional view of a cable bundling device according to the present invention as viewed along the long axis of the device, wherein the cable bundling device utilizes cup shaped finger grips.

Figure 10 shows a cross-sectional view of a cable bundling device according to the present invention as viewed along the long axis of the device, wherein the cable bundling device utilizes removable finger grips and a removable retainer.

Figure 11 shows in perspective a cable bundling device according to the embodiment shown in Figure 10, placed onto a locating cable.

Figure 12 shows a cable bundling device according to the present invention, utilizing a joiner to allow several cable bundling devices to be joined.

Figure 12A shows in perspective a joiner for joining four cable bundling devices.

Figure 12B shows in perspective a joiner for joining three cable bundling devices.

Figure 12C shows in perspective qa joiner for joining two cable bundling devices.

Detailed Description of the Invention

In the Figures, wherein like numerals indicate like elements, there is shown a presently preferred embodiment of a cable bundling device according to the present invention. As shown in Figure 1, the device 100 includes a flexible arcuate strap 102. The strap 102 is preferably made from a material having an elastic tendency to return to a

relaxed state. Such materials include various plastics, such as nylon and teflon. Alternately, the strap may be formed from a metallic material such as spring steel, as shown in Figure 5, and discussed further below.

The device 100 of the present invention has three states. The normal state is associated with a relaxed state of the device 100, in which the first 104 and second 106 ends substantially abut, preventing cables 128 bundled in the device 100 from freely falling from the cavity 126 of the device 100. The second state of the device is when the first 104 and second 106 ends have been forced apart to open the mouth 124 of the device 100. The third state is a locked state discussed further below.

The strap of the present invention may be made from any flexible material, as long as the material has sufficient strength and resiliency to accomplish the present invention. Flexible plastics, metal, rubber, are preferred due to the ease with which the cable bundling device can be formed from these materials. The finger loops which are provided to allow the two ends to be separated may be integrally formed with the strap, or may be formed separately and attached to the strap, such as through bonding, welding, or mechanical fastening.

The strap has a first 104 and a second 106 end. In the relaxed state, the ends 104 and 106 of the strap substantially complete the circumference of the arcuate shape of the strap. The first end 104 of the strap has a male engagement structure such as a raised tooth 108 (shown in Figure 1A which is a detail view of the mouth area of Figure 1) extending above the outer surface 110 of the strap. The tooth 108 is at its highest at its point 114 opposite the first end 104 of the strap, and tapers to join the outer surface 110

of the strap 102 adjacent the first end 104 of the strap. The second end 106 of the strap 102 has a slot 112 through the material of the strap 102. The slot 112 has a front edge 118 which is parallel to a long axis of the device (shown in Figure 3 as 302), such that when the tooth 108 is placed in the slot 112, the face 116 of the tooth rests against the front edge 118 of the slot 112.

First 120 and second 122 finger grips are located adjacent to the first 104 and second 106 ends of the strap 102. The finger grips 120, 122 are preferably closed rings or loops through or into which a finger can be inserted. Other shapes, such as a finger hook or a thimble or loops or cup-shaped shell not necessarily closed, can be used, however such shapes may present a tendency to snag on other objects.

The relaxed state of the device 100 results in the mouth 124 of the device (forming the entrance into the cavity 126 of the device) being substantially closed. The first 104 and second 106 ends of the strap 102 may be allowed to overlap, as the desired result is to restrain cables 128 from freely leaving the cavity 126 unless the device 100 is forced into an open state.

As shown in Figure 2, the circumference of the arcuate strap 102 is preferably chosen so that the strap 102 comfortably rests in the palm 202 of a user's hand between the thumb 204 and middle fingers 206. The finger grips 120, 122 are disposed such that the middle finger 206 and the thumb 204 can be inserted into the first 120 and second 122 finger grips. The circumference of the arcuate strap 102 may varied to accommodate differing sizes and amounts of cables to be bundled. Variance of the circumference of the arcuate strap 102 may be coordinated with re-positioning of the finger grips 120, 122 to

maintain correct ergonomic positioning. Although the preferred embodiment allows the arcuate strap 102 to rest in the palm 202 of a user's hand, the only size limitation is the ability of a user to single-handedly operate the finger grips 120, 122 to open the device 100.

As shown in Figure 3, the length 302 of device 100 may be sufficiently long to provide a protective layer in the palm 202 of a hand when cables 118 are being placed into the device 100. The protection provided both helps in keeping a user's hand clean, since the cables do not contact the hand holding the device 100, but also provide a protective layer to prevent friction from causing injury to the hand. Also, the protection provided insulates a user from rough or frayed surfaces associated with a cable.

The orientation of the device 100 in the palm 202 of a user's hand furthermore allows the elbow (not shown) of a user to be used to maintain loop length while cable 128 is being wound into the device 100. With the device 100 in the palm 202 of the hand, the mouth 124 can be opened each time a bight is passed into the device 100, or held continuously open while cable 128 is bundled.

As shown in Figure 4, the device 100 may be placed into a locked closed state by forcing the first end 104 of the arcuate strap 102 into a position under the second end 106, such that the engagement tooth 108 extends through the slot 112 in the second end 106. The strap 102 is preferably formed such that the first end 104 of the strap 102 is biased against the second end 106 when the tooth 108 is inserted into the slot 112. In order to release the locked engagement, the finger grip 120 on the first end 104 may be pushed

inward, disengaging the tooth 108 from the slot 112 and allowing the mouth 124 of the device 100 to be opened.

Although the device is preferably fabricated from a plastic, the device may be fabricated from other materials. Shown in Figure 5, the device 100 may be fabricated from a spring metal strap 502. The finger grips 504, 506 may be attached to the spring metal strap 502, such as by bonding or mechanical fastening. The finger grips 504, 506 are shown in Figure 5 as being riveted 508 to the strap 502. The engagement tooth 108 may also be formed from a separate piece and bonded or mechanically fastened to the strap 502, or may alternately be formed by punching a raised tooth or displaced portion into the strap 502 itself. The slot 112 when used with a metallic strap may also be formed by punching a rectangular hole or displaced portion through the strap 502, or may alternately be formed by punching a tooth shape into the second end 106, such that when the tooth 108 of the first end 104 is aligned with the tooth 510 of the second end 106, the pocket formed by the tooth 510 of the second end allows the tooth 108 of the first end to nest into and engage the tooth 510 of the second end. In order to accomplish such nesting, the second tooth 510 must be sized such that the first tooth 108 will nest inside the second tooth 510.

As shown in Figures 6 and 7, the finger grips 120, 122 do not need to be external to the strap 102, but may rather be integrally formed into the strap 102 itself. Figure 6, shown in partial cross-section, shows a cable bundling device 100 according to the present invention wherein channels 602 have been molded into the sides of the device 100 to allow fingers to pass between backstraps 604 and the body 606 of the device 100.

As shown in Figure 7, the channels 602 result in a constriction in the cavity 126 when viewed along the long axis of the device 100.

Although the presently preferred embodiment relies on a single toothed engagement system for simplicity, multiple tooth engagement systems may be used in conjunction with the cable bundling device 100 of the present invention. Shown in Figure 8 is a multi-tooth engagement system used in conjunction with the present invention. A first end 802 of the strap 102 has multiple teeth 804, each tooth 804 having a consistent size. The teeth 804 face the exterior 808 of the arcuate strap 102 in its relaxed state . The second end 806 of the strap 102 has an inner surface 810 on which multiple teeth 812 are formed, with the size of the teeth 812 consistent with the size of the teeth 804 on the first end 802. The teeth 804, 812 on the first 802 and second 806 ends are preferably back-cut, such that tension in the strap 102 when engaged causes engaged teeth 804, 812 to pull together.

The teeth 804, 812 when engaged can be released simply by pressing inward on the first end 802 of the device. With the device 102 cradled in the palm 202 of a hand, the device 100 can be opened to allow cables 128 to be passed through the mouth 124 into the cavity 126, relaxed to restrain the cables 128 within the cavity 126, and closed to a locked engagement state without having to change the position of the device 100 within a user's palm 202.

In addition to utilizing open ended finger grips, the cable bundling device may utilize finger grips 902 having closed ends 904, such that the finger grips form a cup shape to enclose an inserted finger.

Should the user desire to release the cables 124 , the user can again place the bundling device 100 into the palm 202 of his or her hand, with a thumb 204 and an opposing digit such as the middle finger 206 inserted into the finger grips 120, 122. As the engagement means of the bundling device 100 have an overlying and an underlying feature, the locked state of the bundling device 100 can be released by extending the digit in the finger grip 122 adjacent to the over-riding engagement feature, and extending the finger. Alternately, the engagement feature may be released by clenching the digit in the finger grip 120 adjacent to the underlying engagement feature, or by a combination of extending one digit and clenching the other to cause the engagement features to disengage from each other.

A further embodiment is shown in Figure 10, wherein a retainer 1002 may be further provided to the cable bundling device 100 to allow the cable bundling device 100 to be retained at or along a location, either before or after cables have been placed into the cable bundling device 100, or while cables are being inserted into the cable bundling device 100. The retainer 1002 shown in Figure 10 is formed by a removeable section which may be alternately engaged or removed from the cable bundling device 100. The retainer 1002 may have an aperture 1004 therethrough for receiving a locating cable 1006. The base 1008 of the retainer 1002 may be provided with a slot 1010 to allow the locating cable 1006 to be inserted into the locating cable aperture 1004.

The cable bundling device 100 may be provided with a channel 1012 for receiving a tongue 1011 on the retainer 1002. The channel 1012 may have one or more detents 1014 formed such that when the tongue 1011 is inserted into the channel 1012, the tongue 1011

will be retained in the channel 1012. The channel detents 1014 may be formed by providing a protrusion 1016 on a surface of the channel 1012 and a recess 1018 on a surface of the tongue 1011, such that when the tongue 1011 is properly located within the channel 1012, the protrusion 1016 of the channel 1012 aligns with the recess 1018 on the tongue 1011 itself. The features of a detent 1014 may alternately be reversed, such that the protrusion is formed on the tongue 1011, while the recess is formed on a surface of the channel 1012.

Alternately, the fit between the tongue 1011 and the channel 1012 may be implemented such that a slight interference between the tongue 1011 and the channel 1012 exists, such that friction between the tongue 1011 and the channel 1012 causes retention of the tongue 1011 in the channel 1012. The tongue 1011 and channel 1012 may incorporate a taper from one end to the other to assist with insertion of the tongue 1011 into the channel 1012, while retaining the friction fit when the tongue 1011 is fully inserted into the channel 1012.

Where it is not desired that the retainer 1002 be removeable from the cable bundling device 100, the retainer 1002 may be fixed to the cable bundling device 100, such as by bonding or mechanically joining the retainer to the cable bundling device.

Additionally, where removeable retainers are implemented, the aperture 1004 of the retainer 1002 may be selected such that a snug fit between the aperture 1004 and the locating cable 1006 (as shown in retainer 1020 and locating cable 1022) may be provided to assist in the locating cable 1022 fixing the location of the cable bundling device 100 (i.e., to prevent the cable bundling device 100 from sliding along a locating cable 1022). As the outer diameter 1024 of the locating cable 1022 may vary based on the cable selected,

retainers 1020 having different inner diameters 1020 of the aperture 1004, 1028 may be provided, such that an appropriate retainer may be selected based on the outer diameter 1024 of the locating cable in use, and then be engaged to the cable bundling device.

As also shown in Figure 10, the finger grips 1028 may also be provided with a removeable connection between the finger grips 1028 and the arcuate strap portion 102 of the cable bundling device 100, such that the finger grips 1028 can be attached or removed as required. The use of engageable finger grips 1028 simplifies manufacturing concerns associated with production of the cable bundling device 100, such that pieces can be molded separately, then joined to form the whole device. In addition to utilizing a removeable connection, the finger grips 1028 may be bonded or mechanically joined to the arcuate strap portion as circumstances warrant.

Figure 11 illustrates a cable bundling device according to the embodiment shown in Figure 10 mounted along a locating cable 1006. Such an embodiment may be preferably utilized where a locating cable 1006 is available for positioning bundled cables 1102. Where the removeable connection is utilized, the retainer 1002 may be placed onto the locating cable 1006, cables bundled into the cable bundling device 100, followed by the cable bundling device 100 being connected to the retainer 1002. Such a process may be used to simplify the bundling of cables, such as may occur during set-up or break-down of an exhibit for a trade show.

As shown in Figure 12, the channel 1012 may alternately be utilized to receive a joiner 1202 for joining two or more cable bundling devices 100a, 100b together. The joiner 1202 may have a body 1204 of sufficient length 1206 to allow adequate separation between

cable bundling devices 100a, 100b when the cable bundling devices 100a, 100b are joined. Figure 12A shows a joiner 1202a designed to join four cable bundling devices, while Figure 12B shows a joiner 1202b designed to join three cable bundling devices. Finally, Figure 12C shows a joiner 1202c designed to join two cable bundling devices. It should be apparent that, although designed to join four cable bundling devices, the joiner of Figure 12 could be utilized to join two cable bundling devices, while the remaining legs of the joiner remain unattached to cable bundling devices.

The description of the embodiments herein are provided to enable any person skilled in the art to make and use the present invention. Various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without the use of the inventive faculty. Thus, the present invention is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.